

AAH MAR 2006 Report

GUIDELINES FOR THE HUMANE KILLING OF
FINFISH
FOR DISEASE CONTROL PURPOSES

Article 1

General principles of humane killing of finfish for disease control purposes

1. Disease control contingency plans should be in place at a national level and should contain details of management structure, disease control strategies and operational procedures; finfish welfare considerations should be addressed within these disease control contingency plans.
2. Disease control strategies should also address the finfish welfare issues that may result from animal movement controls.
3. The following principles apply after a decision to kill the finfish has been made.
4. All personnel involved in the *humane killing* of finfish should have necessary competencies for such work. Competence may be gained through formal training and/or practical experience under supervision.
5. As necessary, operational procedures should be adapted to the specific circumstances operating on the premises and should address finfish welfare and biosecurity.
6. Following the decision to kill the finfish, killing should be carried out as quickly as possible and normal farming procedures should be maintained until the killing is implemented.
7. The handling and movement of finfish should be minimised and when done, it should be done in accordance with the guidelines described below.
8. When finfish are killed for disease control purposes, the methods used should result in immediate death or immediate loss of consciousness lasting until death.
9. There should be continuous monitoring of the procedures to ensure they are consistently effective with regard to finfish welfare and biosecurity.
10. When the operational procedures are concluded, there should be a written report describing the practices adopted and their effect on finfish welfare and biosecurity.
11. To the extent possible to minimise public distress, killing of finfish and carcass disposal should be carried out away from public view. For carcass handling, see Chapter X.X.X. (under preparation)

Article 2

Organisational structure

The operational activities should be led by a *Competent Authority* official who has the authority to appoint the aquatic animal technician or operational team for each farm, and ensure that they adhere to the required finfish welfare and biosecurity standards. When appointing such personnel, he/she should ensure that the personnel involved have the required competencies.

The *Competent Authority* official should be responsible for all activities on affected premises and should be supported by coordinators for planning (including communications), operations and logistics to facilitate efficient operations.

The *Competent Authority* official should provide overall guidance to personnel and logistic support for operations on all affected premises to ensure consistency in adherence to the OIE aquatic animal welfare and biosecurity guidelines.

In considering the associated finfish welfare issues, responsibility and competencies required by key personnel to be involved in such work are described in Article 4.

Article 3

Responsibilities and competencies of the operational team or aquatic animal technician

1. Team leader

a) Responsibilities

- i) Plan overall operations on an affected premises;
- ii) determine and address requirements for finfish welfare, operator safety and biosecurity;
- iii) organise, brief and manage team of people to facilitate *humane killing* of the relevant finfish on the premises in accordance with national regulations and these guidelines;

- iv) determine logistics required;
- v) monitor operations to ensure that finfish welfare, operator safety and biosecurity requirements are met;
- vi) report upwards on progress and problems;
- vii) provide a written report at the conclusion of the killing, describing the practices adopted and their effect on aquatic animal welfare and biosecurity outcomes.

b) Competencies

- i) Appreciation of finfish welfare and the underpinning behavioural, anatomical and physiological processes involved in the killing process;
- ii) skills to manage all activities on premises and deliver outcome on time;
- iii) awareness of psychological effects on farmer, team members and general public;
- iv) effective communication skills.

2. Veterinarian/fish health biologist

a) Responsibilities

- i) Determine and implement the most appropriate killing method to ensure that the finfish are killed without avoidable pain and distress;
- ii) determine and implement the additional requirements for finfish welfare, including the order of killing;
- iii) ensure confirmation that all the finfish have been killed at an appropriate time after the stunning/killing procedure;
- iv) minimise the risk of disease spread within and from the premises through the supervision of biosecurity procedures;
- v) continuously monitor finfish welfare and biosecurity procedures;

- vi) in cooperation with the team leader, prepare a written report at the conclusion of the killing, describing the practices adopted and their effect on finfish welfare.
- b) Competencies
 - i) Ability to assess finfish welfare, especially the effectiveness of stunning and killing and to correct any deficiencies;
 - ii) ability to assess biosecurity risks.

3. Aquatic animal technician

- a) Responsibilities

Assist when requested.
- b) Competencies
 - i) Specific knowledge of finfish, and their behaviour and environment;
 - ii) review on-site facilities in terms of their appropriateness for mass destruction;
 - iii) design and construct temporary finfish handling facilities, when required;
 - iv) experience in finfish handling procedures.

4. Personnel responsible for killing

- a) Responsibilities

Ensure *humane killing* of finfish through effective stunning/killing.
- b) Competencies

- i) When required by regulations, licensed to use necessary equipment;
- ii) competent to use and maintain relevant equipment and methods for the finfish species involved;
- iii) competent to assess effective stunning/killing.

5. Carcass disposal personnel

a) Responsibilities

Ensure efficient carcass disposal to ensure killing operations are not hindered.

b) Competencies

Competent to use and maintain available equipment and apply techniques for the finfish species involved.

Article 4

Operational guidelines

1. Planning humane killing of finfish

A plan for the *humane killing* of finfish on affected premises should be developed by the *Competent Authority*. The plan should include consideration of:

- a) minimising handling and movement of finfish;
- b) killing the finfish on the affected premises; however, there may be circumstances where the finfish may need to be moved to another location for killing; when the killing is conducted at finfish slaughterhouse, the guidelines in Appendix X.X.X. should be followed;
- c) the species, number, age and size of finfish to be killed;
- d) methods of killing the finfish, and the costs thereof;
- e) the availability of chemicals/equipment needed for the killing of the finfish;
- f) the facilities available on the aquaculture premises for sampling of dead finfish following the killing;
- g) biosecurity issues;
- h) any legal issues that may be involved, in example where restricted veterinary drugs or poisons may be used, or where the process may impact on the environment, and
- i) the presence of other nearby aquaculture premises;
- j) implementation time.

In designing a killing plan, it is essential that the method chosen be consistently reliable to ensure that all finfish are humanely and quickly killed.

2. Killing of finfish

a) Single individuals

Any moribund, injured or seriously sick finfish with no chance of recovery should be killed humanely without delay.

Such finfish should be caught by a net and killed instantly by a blow to the head or by a suitable anaesthetic. Only anaesthetics registered for use in finfish should be used. No finfish should die by asphyxiation.

b) Mass kill

Mass kill of finfish for disposal due to disease control or other purposes should be conducted under the supervision of the *Competent Authority*. The method of choice will depend on whether the killing takes place in a closed-, semi-closed- or open system.

Signs of effective stunning/killing include:

- i) absence of respiratory movement (loss in opercular activity);
- ii) absence of visual evoked response (VER);
- iii) absence of vestibulo ocular reflex (VOR, eye rolling);
- iv) absence of tail reflex and muscular movements.

Article 5

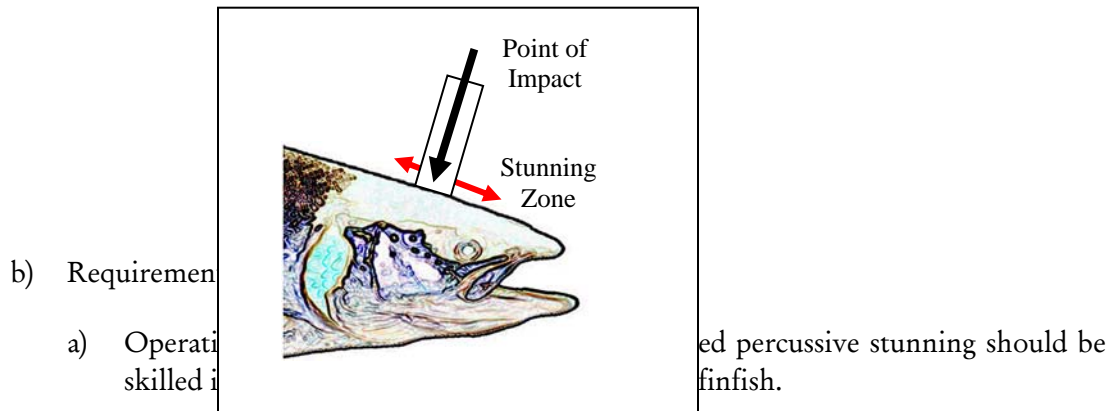
Mechanical stunning methods for finfish

1. Percussive stunning

a) Introduction

Killing by a blow to the head may be an appropriate *humane killing* method for larger finfish, when the number of finfish is limited. Operating personnel using this method for killing should be competent to ensure the method is performed properly. Ideally, this method should be followed by decapitation, pithing or exsanguination. Percussive stunning is an irreversible method in more than 99% of the cases if correctly applied. The finfish should be out of water for only 5–10 seconds before

blow is applied.



- b) Finfish should be quickly removed from the water, restrained and given a quick blow to the head, delivered either by a club or by mechanical stunning device.
- c) The blow should be of sufficient force and delivered above or adjacent to the brain in order to render immediate unconsciousness.
- d) The finfish should be inspected to check the effectiveness of stunning, and restunned if necessary.

c) Advantages

When percussive stunning is applied correctly, loss of consciousness is immediately.

d) Disadvantages

When the method is used improperly, immediate unconsciousness is not achieved and injuries as well as poor welfare to the finfish may occur. Manual percussive stunning is only practicable for the killing of a limited number of finfish. Defined criteria for all types of finfish are lacking.

e) Conclusion

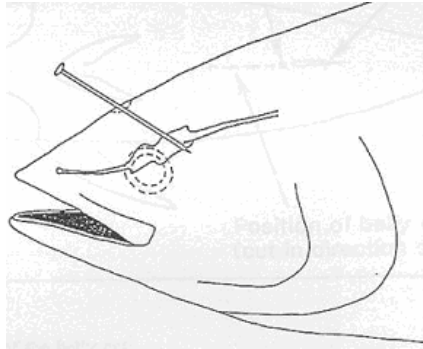
Percussive stunning is suitable for killing finfish species such as salmonids and halibut and should ideally be followed by decapitation, pithing or exsanguination to ensure death.

2. Spiking, coring and Iki-jime

a) Introduction

Spiking, coring or Iki-jime are irreversible killing methods for finfish based on physical damage to the brain by inserting a spike into the brain either manually or

using specially developed equipment to destroy sensory and motor functions in large finfish. The so-called captive needle stun is a modification of spiking.



The spike should be aimed on the skull in a position to penetrate the brain of the finfish and the impact of the spike should produce immediate unconsciousness. Physical damage to the brain caused by penetration of the bolt may result in death; however, pithing or bleeding should be performed as soon as possible after the shot to ensure the death of the finfish. The elapsed time between capture and spiking should be between 5–10 seconds and a minute.

b) Requirements for effective use

- i) Operating personnel using manual or automated spiking equipment should be skilled in order to ensure the *humane killing* of finfish.
- ii) Only specifically designed devices should be used.
- iii) Finfish should be quickly removed from the water, restrained and the spike immediately inserted into the brain either manually or by an automated device.
- iv) The spike should be inserted in such a way that the brain is completely destroyed.

c) Advantages

Immediate onset of unconsciousness occur when the spike is correctly and accurately applied and with immediate loss of movements and visual evoked response (VER).

d) Disadvantages

- i) Difficult to apply in agitated finfish.
- ii) The handling of the finfish during spiking may result in inaccurate application of the spike positioning and orientation may cause disabling and injuries to the finfish and thus poor finfish welfare will occur.
- iii) Not applicable under field conditions unless the finfish farm is equipped with sanitary slaughter equipment for the purpose.

e) Conclusion

The method is suitable for killing larger finfish (including tuna) when used in finfish slaughterhouses or in farms equipped with sanitary slaughter equipment.

3. Free bullet

a) Introduction

Shooting by using a free bullet may be used for killing large finfish (tuna). The finfish may either be crowded in the net and shot in the head, or caught and held in a fixed position in the surface of the net (gaffing) prior to being shot in the head. Commonly used firearms for shooting large finfish include a 12-bore shotgun and a Magnum handgun (0.357).

b) Requirements for effective use

The finfish should be positioned correctly and the shooting range should be as short as practicable.

c) Advantages

Shooting may be an effective and humane method for killing large finfish as minimal handling and restraint are required.

d) Disadvantages

- i) Gaffing causes pain.
- ii) Gun noise may cause stress reactions.
- iii) May be hazardous to operating personnel.
- iv) Contamination of the working area due to release of body fluids may present a biosecurity risk.

e) Conclusions

The method is suitable for killing large finfish under field conditions.

Article 6

Electrical stunning

1. Introduction

Electrical stunning involves the application of an electrical current of sufficient strength,

frequency and duration to cause immediately unconsciousness. Provided sufficient current is applied, finfish will not recover consciousness.

2. Requirements for effective use

- a) Operating personnel of electrical stunning equipment should be competent in applying the method properly.
- b) The electrical stunning device should be constructed and used for the specific finfish species and their environment.
- c) The equipment used for stunning should be maintained and operated in accordance with the manufacturer's recommendations, and it should be tested on a regular basis to ensure that the power output is adequate.
- d) The equipment must only be used in the finfish species that it has been designed for.
- e) It should be ensured that heads of the finfish are confined beneath the surface of the water, and that there is a uniform distribution of electrical current in the stun tank or chamber.
- f) Uniform distribution of an appropriate electrical current in the water bath in which the finfish are contained.
- g) The time between crowding and stunning should be kept to a minimum.

Since finfish for disposal do not need to be bled, the duration of the current in the bath should be of sufficient length to ensure that the finfish are dead. An effective stun and kill should be verified. Signs of correct stunning include:

- h) immediate loss of respiratory movement (loss in opercular activity);
- i) loss of visual evoked response (VER);
- j) immediate loss of vestibulo ocular reflex (VOR, eye rolling);
- k) loss of tail reflex and muscular movements.

3. Advantages

- a) Electrical stunning is humane as the method may stun and kill immediately, and the finfish do not have to be removed from the water.
- b) A large number of finfish may be stunned/killed simultaneously with minimum handling and restraint.
- c) Non-invasive technique minimises biosecurity risk.

4. Disadvantages

- a) Requires industrial finfish slaughterhouse premises or similar and is not applicable for mass kill of finfish under field conditions.
- b) The electrocution equipment should be applied and maintained correctly to produce an effective stun and kill.
- c) Requires a reliable supply of electricity.
- d) May be hazardous to operating personnel.

5. Conclusions

The method is suitable for killing finfish under controlled conditions.

Article 7

Chemical and physical killing methods

1. Use of chemicals added to the water

Chemicals used for killing finfish should kill the finfish effectively, not merely have an anaesthetic effect. When using such chemicals, the operating personnel should ensure that the solution has the correct concentration, and that sea water is used for marine finfish species and freshwater for freshwater species. If a chemical solution is to be used several times, aeration or oxygenation of the solution should be carried out to avoid suffocation.

Finfish should be kept in the chemical solution until they are dead. Finfish that are merely anaesthetised should be killed by another method such as bleeding, decapitation or appropriate mechanical stunning.

Suitable chemicals include:

- a) Benzocaine hydrochloride can produce a deep anaesthesia when added in an overdose to water. Since the solubility of benzocaine in water is low, it has to be administered from a stock solution of either ethanol (10%) or propylenglycol (5%). A final solution of 100 mg/liter is sufficient to kill finfish.
- b) Iso-eugenol (2-methoxy-4-propenylphenol (Aqui S) is effective for killing finfish. The effective dose for killing is 25 ml/1000 liter of water.
- c) Metacaine (tricaine metansulfonat, MS 222) has a similar effect as benzocaine. The solubility in water is high. A final solution of 100 mg/liter is sufficient to kill finfish, but a concentration of ≥ 250 mg/liter for 10 minutes following cessation of opercular movements is recommended.
- d) Metomidate hydrochloride is effective in anaesthetising fish in aquaria – and non food species of several fish classes as well as catfish, salmonids, etc. Induction of

anaesthesia is rapid (1–2 minutes) and without stress reactions such as elevated heart rate. In salmonids, the recommended dose is 2–6 mg/liter of water. Metomidate may give inadequate anaesthesia of larvae of some fish species such as goldfish and red drum.

- e) Rotenone is effective for killing finfish and may be used for mass killing of feral finfish when they are still in natural water courses. The effective dose of active rotenone is 0.025 to 0.15 g/1000 liter depending on finfish species to be killed. Rotenone is less effective at temperatures below 10°C and in water with high sediment content. The effect of rotenone is reversible and finfish may be revived if introduced into oxygenated water without rotenone.

2. Requirements for effective use

- a) Sufficient quantities of the chemical need to be added to the water.
- b) Should be followed by killing if finfish are merely anaesthetised.

3. Advantages

- a) Large numbers of finfish may be stunned in one batch.
- b) Handling is not required until finfish are anaesthetised or euthanized.
- c) Biosecurity.

4. Disadvantages

- a) May need to be followed by killing if finfish are anaesthetised only.
- b) Care is essential in the preparation and provision of treated water, and in the disposal of treated water and contaminated carcasses.

5. Conclusion

The method is suitable for killing large numbers of finfish in closed compartments.

Article 8

Unacceptable methods, procedures or practises on finfish welfare grounds

The following methods are not acceptable for killing finfish on welfare grounds:

- a) The use of CO₂ alone or in combination with chilled water/crushed ice is not acceptable for the mass table killing of finfish, due to its aversive effects.

- b) Salt or ammonia baths used on eels are unsuitable due to their aversive effects.
- c) Asphyxiation is unsuitable as sensation is not lost during the slow induction.
- d) Exsanguination is unsuitable for killing conscious finfish.

Article 9

Other killing methods

1. Decapitation

a) Introduction

Decapitation, using a sharp device such as a guillotine or knife, may be used for killing finfish but only following anaesthesia; the method results in death by cerebral ischaemia.

b) Requirements for effective use

The required equipment should be kept in good working order.

c) Advantages

The technique is effective for the killing of eels when applied properly.

d) Disadvantages

Contamination of the working area due to bleeding and body fluids may present a biosecurity risk. The method is not applicable to other finfish species than eel.

e) Conclusion

The method is suitable only for killing eels.

2. Maceration

a) Introduction

Maceration by a mechanical device with rotating blades or projections causes immediate fragmentation and death in newly hatched finfish and embryonated eggs, as well as fertilised/unfertilised eggs of finfish. It is a suitable method for the processing of such material. The procedure results in immediate death and a large number of eggs/newly hatched fry can be killed quickly and humanely. For biosecurity reasons, macerated material from infected finfish should be treated by one of the processing methods given in OIE Guidelines for handling and disposal of carcasses and waste of aquatic animals (in preparation).

Maceration requires specialised equipment which should be kept in good working order. The rate of introducing material into the device should be such that the equipment does not jam.

b) Conclusion

The method is suitable for killing large numbers of eggs/newly hatched fry of finfish.

Article 10

Table summarising acceptable killing methods for finfish*

Species	Method	Animal welfare concerns / implications	Additional comments
Salmonids, cod (gadids) and flatfish	Anaesthetic overdose using benzocaine, metacaine, iso-eugenol.	Considered to have a low impact on welfare but mode of operation of chemicals in all species is not known.	Applicable to all sizes of finfish
	Percussive stunning.	Should be properly applied to be humane and effective. Low impact on welfare.	Suitable for finfish handled individually

	Electrical stunning.	The equipment should be maintained and applied correctly to produce an effective stun and kill. Low impact on welfare. Suitable in salt water.	May be hazardous to personnel. Applicable to all sizes
Tuna	Spiking, coring, Iki-Jime.	When applied properly, the finfish are killed instantly.	Applicable to all sizes
	Free bullet.	When applied properly, the finfish are killed instantly.	Applicable to all sizes. Operator safety needs to be addressed.
Cyprinids	Anaesthetic overdose using benzocaine, metacaine, iso-eugenol.	Considered a low impact on welfare but mode of operation of chemicals in all species not known.	Applicable to all sizes
Eels	Decapitation.	Negative impact on welfare. Acceptable if preceded by anaesthesia	
	Electrical stunning.	Eels are resistant to electrical stunning and require high currents for at least 5 minutes to achieve insensibility. Negative impact on welfare.	May be hazardous to personnel.
	Percussive stunning.	Low impact on welfare.	Suitable for finfish handled individually.

Species	Method	Animal welfare concerns / implications	Additional comments
Ornamentals	Anaesthetic overdose using benzocaine, metacaine, iso-eugenol.	Considered a low impact on welfare but mode of operation of chemicals in all species not known.	Applicable to all sizes.
Other species	Spiking, coring and Iki-jime (tuna).	When applied properly, the finfish are killed instantly.	
	Percussive stunning.	Should be properly applied to be humane and effective. Low impact on welfare.	Suitable for finfish handled individually
	Electrical stunning.	The equipment should be maintained and applied correctly to produce an effective stun and kill. Low impact on welfare.	May be hazardous to personnel. Applicable to all sizes.
	Anaesthetic overdose using benzocaine, metacaine, iso-eugenol.	Considered a low impact on welfare but mode of operation of chemicals in all species not known.	Applicable to all sizes
Newly hatched fry/eggs of any finfish species	Maceration.	Low impact on welfare.	

* The order of description of the methods is not in an order of acceptability from a finfish welfare point of view.

Note: The table does not represent an exclusive list of acceptable methods.

Handling of finfish killed for disposal

See Appendix X.X.X. (under preparation) on the Guidelines for the handling and disposal of carcasses and waste of aquatic animals.